

What is claimed is:

1. A non-destructive testing system comprising:
an energy emitter head assembly for directing high energy at an object to be tested;
a detector that detects resultant energy from the object;
a coolant flow path formed in the head assembly;
a filter holder;
a filter carried in the holder; and
a detachable connection between the holder and the head assembly that allows the holder to be quickly and easily detached from the head assembly for filter servicing while substantially leaving the remainder of the head assembly intact and assembled together.
2. The non-destructive testing system of claim 1 wherein the filter holder comprises a cover plate for being secured to the head assembly and a filter screw for being threaded to the cover plate.
3. The non-destructive testing system of claim 2 wherein the filter screw can be unthreaded from the cover plate for filter servicing with the cover plate attached to or removed from the head assembly.
4. The non-destructive testing system of claim 1 wherein the detachable connection is a threaded connection.
5. The non-destructive testing system of claim 1 wherein the emitter head assembly is an X-ray goniometer head, and the detector comprises a pair of detectors carried by the X-ray head.
6. The non-destructive testing system of claim 1 wherein the head assembly is an X-ray head comprising an X-ray diffraction tube and a housing surrounding at least a portion of the X-ray diffraction tube; and
liquid coolant for conducting heat away from said X-ray diffraction tube;

the housing including the flow channel for channeling flow of said liquid coolant;

the filter holder having a head portion and a stem portion with the filter carried in the stem portion;

the housing including a receptacle for receiving the filter holder to allow the filter to be disposed in the flow channel to thereby provide cleaning of the liquid coolant.

7. The non-destructive testing system of claim 6 wherein the stem portion defines a hollow bore dimensioned to receive said filter.

8. The non-destructive testing system of claim 6 wherein said head portion is enlarged with respect to said stem portion.

9. The non-destructive testing system of claim 6 wherein said filter holder is removably received in said receptacle via the detachable connection.

10. The non-destructive testing system of claim 6 wherein said filter holder comprises a filter screw having a threaded portion along said stem portion.

11. The non-destructive testing system of claim 6 wherein said stem portion defines a cross hole and an internal bore for receiving said filter with the internal bore communicating with said cross hole.

12. The non-destructive testing system of claim 11 wherein said housing receptacle includes a threaded portion and said stem portion includes a threaded portion for mating engagement with the housing receptacle.

13. The non-destructive testing system of claim 6 wherein said housing includes an outer wall containing said receptacle and said receptacle communicates with the exterior of said housing so that the filter holder is accessible from outside the housing.

14. The non-destructive testing system of claim 13 wherein said outer wall comprises one of a cooling head and a heat sink member.

15. The non-destructive testing system of claim 14 wherein the filter holder includes the cooling head.

16. The cooling system of claim 13 wherein the receptacle includes a socket portion for receiving the stem portion of the filter holder, the socket portion including a socket wall portion for deflecting coolant flow passing through said cross hole, through said stem portion.

17. The cooling system of claim 6 wherein said X-ray diffraction tube includes an anode assembly and a heat sink in thermal communication with the anode assembly.

18. The cooling system of claim 17 wherein said heat sink defines a socket portion for directing coolant flow exiting said filter holder in a direction generally toward said head portion.

19. The cooling system of claim 6 wherein said housing comprises a hollow jacket surrounding said X-ray diffraction tube with the hollow interior of said jacket comprising said flow channel.

20. The cooling system of claim 19 wherein said hollow jacket has a generally cylindrical configuration and said housing further includes a cooling head engageable with one end of said cylindrical hollow jacket, said cooling head defining an internal passageway in flow communication with the flow channel of said hollow jacket.

21. The cooling system of claim 20 wherein said internal passageway extends radially in said cooling head.

22. The cooling system according to claim 21 wherein said housing receptacle is located generally at the center of said cooling head, said cooling head defining diametrically opposed flow passageways of the internal passageway including inlet and outlet flow passageways extending in a generally radial direction.

23. The cooling system of claim 6 wherein the interior of said housing is maintained free of said liquid coolant.

24. An X-ray diffraction device comprising:
an X-ray diffraction tube including an anode assembly;

a housing surrounding at least a portion of the X-ray diffraction tube;
a liquid coolant for conducting heat away from said X-ray diffraction tube;

the housing including a flow channel for channeling flow of said liquid coolant, said flow channel passing adjacent said anode assembly so as to withdraw heat therefrom;

a filter holder having a head portion and a hollow stem portion;

a filter carried in said hollow stem portion; and

the housing including a receptacle for removably receiving the filter holder so as to dispose the filter in the flow channel to thereby provide cleaning of the cooling medium.

25. The cooling system of claim 24 wherein said stem portion defines a cross hole and an internal bore for receiving said filter with the internal bore communicating with said cross hole.

26. The cooling system of claim 25 wherein said housing receptacle includes a threaded portion and said stem portion includes a threaded portion for mating engagement with the housing receptacle.

27. The cooling system of claim 24 wherein said housing comprises a hollow jacket surrounding said X-ray diffraction tube with a hollow interior of said jacket comprising said flow channel.

28. The cooling system of claim 27 wherein said hollow jacket has a generally cylindrical configuration and said housing further includes a cooling head engageable with one end of said cylindrical hollow jacket, said cooling head defining an internal passageway in flow communication with the flow channel of said hollow jacket.

29. The cooling system according to claim 28 wherein said housing receptacle is located generally at the center of said cooling head, said cooling head defining diametrically opposed flow passageways including inlet and outlet flow passageway extending in a generally radial direction.

30. The cooling system of claim 24 wherein said anode assembly includes a heat sink portion that defines a socket portion for directing coolant flow exiting said filter holder in a direction generally toward said head portion.

31. The cooling system of claim 24 wherein the housing includes a cooling head, the housing receptacle includes a socket of the cooling head, and

a fluid directing assembly removably carried in the cooling head socket for directing liquid coolant in a predetermined pattern at the anode assembly with removal of the fluid directing assembly permitting substantially unobstructed viewing of the anode assembly through the cooling head socket.

32. A cooling system for cooling a heat source comprising:
an inner housing surrounding at least a portion of the heat source;
liquid coolant for conducting heat away from said heat source;
an outer housing including a flow channel for channeling flow of said liquid coolant;
a filter holder having a head portion and a hollow stem portion;
a filter carried in the hollow stem portion;
said stem portion defining a cross hole and an internal bore for receiving said filter with the bore communicating with said cross hole; and
a cover for the outer housing including a receptacle for removably receiving the filter holder so as to dispose the filter in the flow channel to thereby provide cleaning of the liquid coolant.

33. The cooling system of claim 32 wherein said filter comprises a body of screen work material having a preselected mesh size to filter particulates from said liquid coolant.

34. The cooling system of claim 32 wherein said cover includes an outer wall containing said receptacle and said receptacle communicates with the exterior of said outer housing so that the filter holder is accessible from outside the outer housing.

35. The cooling system of claim 34 wherein the receptacle includes a socket portion for receiving the stem portion of the filter holder, the socket portion including a socket wall for causing coolant flow exiting said filter holder, to flow through the stem portion.

36. The cooling system of claim 32 further comprising a heat sink comprising a portion of said inner housing and defining a socket portion for directing coolant flow exiting said filter holder in a direction generally toward said head portion.

37. The cooling system of claim 32 wherein said outer housing comprises a generally cylindrical hollow jacket surrounding said heat source, with a hollow interior of said jacket comprising said flow channel, said cover comprising a cooling head engageable with one end of said cylindrical hollow jacket, and said cooling head defining an internal passageway in flow communication with the flow channel of said hollow jacket.

38. The cooling system according to claim 37 wherein said receptacle is centrally located in said cooling head, said cooling head defining diametrically opposed flow passageways including inlet and outlet flow passageways extending in a generally radial direction.

39. A method of cooling an X-ray diffraction tube, comprising:
surrounding at least a portion of the X-ray diffraction tube with a housing;
providing the housing with a flow channel for channeling flow of a liquid coolant;

providing a filter holder having a head portion and a stem portion;
providing a filter;

carrying the filter on the stem portion;
receiving the filter holder in the housing so as to dispose the filter in the flow channel; and

flowing the liquid coolant through the flow channel so as to filter the liquid coolant.

40. The method of claim 39 wherein the filter is received in the housing by threading the stem portion of the filter holder to a cooling head of the housing.

41. The method of claim 39 including removing the filter holder from the housing for filter servicing leaving the housing in surrounding relation to the X-ray diffraction tube.

42. The method of claim 39 further comprising defining in the stem portion a hollow bore dimensioned to receive said filter.

43. The method of claim 42 further comprising defining in said stem portion a cross hole with the bore communicating with said cross hole.